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ABSTRACT

Although policymakers have recently tended to call for longer school days or years, such reforms might be ineffective or counterproductive if they fail to take into account the interactions between time and other determinants of learning, including the role of the student in allocating time. Research has shown that the amount of learning is a function of capacity, effort, time, and quality of resources. Since effort is a variable determined by the student, means must be found to increase it by developing motivators either intrinsic or extrinsic to the curriculum. Extrinsic motivators, which seem to be losing their appeal to students, include rewards provided by parents, school and society; expectations of economic success; and fear of economic failure. Extrinsic motivators are difficult to manipulate. Cost analysis indicates that investing in upgrading the quality of teaching resources would cost less than increasing school hours and student workloads and would enhance learning. Furthermore, no good evidence suggests that adding days to the school year improves performance; even so, many states are making such additions. More research is needed before sweeping reforms can be justified. (FWR)

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CLOCKING INSTRUCTION: A Reform Whose Time Has Come?

By Henry M. Levin

A centerpiece of the new quest for educational reform is the transformation of schools to make more effective use of time in learning. The National Commission on Excellence in Education in its report, *A Nation At Risk*, argued for "...more effective use of the existing school day, a longer school day or a lengthened school year (p. 19)." Specific recommendations included the assignment of more homework so that learning could be increased outside of school; introduction of 7 hour school days in place of 5-6 hour days; adoption of a 200- to 220-day school year instead of the typical 180 days; policies to reduce disruptions of instruction; and more effective use of teachers' time for instructional tasks. The Task Force on Education for Economic Growth in its report, *Action for Excellence*, urged every state to "...increase both the duration and the intensity of academic learning time (p. 38)." In response to the evidence in these reports, state legislatures are considering increases in the minimum school day and school year. The California legislature passed such legislation in 1983, and the North Carolina legislature approved a pilot project to increase the school year from the present 180 days to 200 days and the school day from 6 to 7 hours for two counties.

The case in favor of the more effective use of time is based upon logic, international comparisons, and research. Clearly, the amount of time that one is exposed to instruction or engaged in learning must bear some relation to what is learned. Moreover, other nations whose educational systems are ranked highly have longer daily and yearly sessions than those of the U.S. *A Nation At Risk* compares the U.S. to England and other industrialized countries where academic high school students spend 8 hour days and 220 day school years (National Commission on Educational Excellence 1983: 21). *Action for Excellence* concludes that after twelve years of schooling, students in other advanced nations may have the equivalent of four full years more schooling than American high school graduates. Both reports also point out that U.S. students do not fare well in international comparisons of achievement and that the future competitive position of the U.S. in the world economy is at stake if the U.S. does not follow this and other reforms.

Finally, educational researchers have agreed that the use of time in learning is a prime area for educational reform on the basis of its relation to student achievement. Although some of the research focuses on the total time devoted to schooling, much of it addresses using existing allocations of time more productively. The general consensus of educational researchers seems to be that time is a "potent" lever for increasing student achievment.

As compelling as the logic and evidence might appear, careful scrutiny suggests that the consequences of increasing the time allocated to schooling and making its use more effective are hardly as straightforward or as effective in improving achievement as they have been advertised. Indeed, I will argue that there is great danger if these types of prescriptions are applied in a mechanical fashion without considering other factors.

Research on time in learning has had a long history, and there is apparent consensus in the literature on the subject. The most important findings are:

1. Total instructional time in a specific curriculum area is positively related to student achievement in that area; and
2. The proportion of instructional time that a student is engaged in academic tasks at an appropriate level of difficulty is positively associated with learning.

The implications of this research are that the total amount of time allocated to instruction and the use of that time are important policy variables for increasing student achievement. Thus, national reports on educational reform and state legislation have focused on efforts to increase the length of the school day and school year, to improve school attendance, to reduce class disruptions and unproductive use of teacher time, and to increase the amount of student engagement on instructional tasks. To a large degree these recommendations and legislative actions are oblivious to two major issues:

(1) interactions between time and other determinants of learning; and

(2) the role of the student in allocating time.

1. Time and Learning

As with other types of human performance, the amount that will be accomplished or learned will be determined by four factors: capacity of the individual to learn; effort of the individual to learn; time of the individual allocated to learning; and quality of resources available to

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EA 016 852

assist the individual to learn. These can be summarized by the following expression:

(capacity) x (effort) x (time)
x (quality of resources)

This framework enables us to see where the time variable fits into the learning activity. Before discussing this phenomenon, it is necessary to provide some detail on the formulation.

Capacity refers to the personal attributes of the student with respect to the learning task. Different students have different aptitudes to learn specific subjects. The meaning of aptitude in this sense is much broader than ability, since it includes all factors which will determine the capacity of a student to learn at a given time. Thus, the term includes factors related to intellectual ability, personality, health and nutrition, and emotional strengths and weaknesses. Capacity can change depending on the learning task or subject, so it should always be referred to in terms of a specific task.

Effort refers to the intensity of use of capacity to achieve learning *per unit of time*. Learning occurs when the student devotes effort to applying his or her capacity to a specific learning task or set of tasks. The greater the effort, capacity held constant, the more that will be learned. Indeed, students of lower capacity who put in great effort may learn considerably more than those of higher capacity who do not put in such effort for any time period.

Time refers to the period devoted to a specific learning endeavor. Time can be allocated to learning both inside and outside the classroom, so different categories can be used to analyze the time dimension. Likewise, even within the classroom it is possible to categorize different uses of time. Learning will be a function of increasing time, capacity and effort held constant, and some uses of time will be more effective than other uses.

Quality of Resources refers to the amount and type of resources available to the learner. Obviously, this will consist not only of such factors as the quality of instruction, but also the availability of textbooks, other instructional materials, and the characteristics of the learning facility and home.

A major advantage of the formulation set out above, which will be referred to by the acronym CETQ, is that it makes it possible to put the time variable within a larger set of learning factors. Thus, the linkages among these factors and their implications for the time dimension can be reviewed.

The capacity of a child to learn is conditioned by his or her mental and physical state at the time learning is to take place, as well as by the child's overall aptitude to learn. Some children commonly lack the nutritional, medical, dental, and housing resources to utilize their learning opportunities. Even with high levels of effort, large time allocations to instruction, and high quality learning resources, their capacity is limited by their personal situation. Children with nutritional deficiencies, emotional problems, and disease are not likely to learn a great deal more from spending more time on a particular instructional task. Thus, there is likely to be an important interaction between the capacity of the child to learn and the effectiveness of additional time.

These factors also determine effort. It is difficult to put much effort into learning when suffering from low energy levels, dizziness, headaches, and other maladies. Effort is also a matter of motivation, a factor which can be affected by the quality of instruction. It is conceivable that extending the time allotted to schooling and particular subjects may actually reduce the level of effort substantially if the quality of instruction and other learning resources is poor. Effort may also be reduced by sheer fatigue associated with additional time.

Finally, the quality of instructional resources clearly has implications for the effectiveness of additional time devoted to learning. If teachers are unqualified, books and materials are in short supply, the curriculum is inappropriate, or classrooms are noisy and overcrowded, additional time devoted to instruction may be relatively unproductive. Indeed, it may be more cost-effective to improve the quality of resources than to increase instructional time.

In summary, there are likely to be important interactions among the various factors determining the amount of learning that takes place. Some combination of improvements in all of these factors may yield better returns to schooling investments than focusing only on time.

2. The Student As A Timekeeper

Much of the literature on time in learning treats the time variable as a policy instrument which can be manipulated at will by school authorities. The assumption is that by assigning longer periods of instruction and homework, learning will increase. However, once we focus on the time that students devote to learning rather than that of the teacher, school, or educational system, it is obvious that a central decision maker on time allocation is the student.

Although one can require more homework and increase the length of the school day or school year or the exposure of students to particular subjects, the amount that will be learned is hardly a mechanical function of the time allotment. If students do not listen or concentrate on their studies or put much effort into them, the additional time may be wasted or even counter-productive.

For a student to reallocate his or her time to learning, some kind of increase in individual welfare must result. This can take the form of greater intrinsic rewards, or extrinsic rewards conferred by the school, parents or society. Generally, the larger the value of these rewards to the individual for any learning activity, the more time and effort that will be devoted to it.

Intrinsic rewards refer to the satisfaction received from the activity itself. For example, if reading literature or solving mathematics problems provides its own pleasure to the learner, he or she will wish to pursue those subjects — at least in part — for the sheer joy of the activity. The obvious educational implications are that one way to increase both the time and effort devoted to a subject or to schooling more generally is to make it more interesting and engaging. This view is at the heart of John Dewey's vision of schooling, where the intrinsic value of the activity is central in determining if the educational activity is worthwhile.

However, schools rarely operate on the basis of motivation through intrinsic rewards. More typically, students are expected to pursue learning activities because of rewards provided by parents, the school and society and the expectation of future economic success, or the fear of future economic failure by doing poorly in school. Schools have at their disposal such sanctions as grades, promotion, social praise, detention, and a host of other ways that students can be rewarded for appropriate behaviors and punished for inappropriate ones. By manipulating these sanctions, individual teachers and schools and the educational system attempt to influence the time and effort that students devote to their studies. Again, it is important to remember that even when the school increases the

time requirement for instruction, students can reduce their effort, so that mandatory time allocations in themselves may not be effective without these sanctions.

Parents have control over many of their childrens' activities and can provide valued rewards for "appropriate" school behavior. If parents value educational achievement for their offspring, they are likely to confer praise, gifts, opportunities, and pleasurable activities upon their children in relation to school performance. Likewise, they are likely to withold such rewards and restrict their childrens' activities when school performance is considered inadequate.

The very fact that these systems of control are so central to the schooling experience suggests that student behavior is not based on the intrinsic awards. That is, most students attend school and conform to the organizational demands of schooling, not because it is the way that they would choose to spend so much time, but because it is compulsory, expected by parents, and has a payoff in the future. Even beyond the parental and school sanctions, schooling is valued because of its expected future returns in terms of access to more schooling and eventual earnings and occupational payoffs.

To the degree that students are motivated to go to school by factors beyond compulsion of the state and family, it is because schooling and study can be converted into future gains of income, occupation, employment, and social status rather than its intrinsic value. That is, beyond the schooling experience, educational credentials are commodities that can be exchanged for success in future economic well-being.

Not only have the extrinsic rewards for academic accomplishment declined for most of the youth population, but even the incentives to do well in order to undertake further study have diminished. Many colleges and universities are advertising for students. As college entrance has become easier with the drastic decline in youth demography, and as economic returns for higher education and job prospects have declined, youth may be putting less time and effort into their studies.

Certainly, this explanation is consistent with the evidence. Studies at the secondary level have found profound shifts away from the academic subjects, rising dropout rates and falling test scores. Although recent reports have blamed the schools for these problems and have urged greater compulsion, more discipline, and more rigorous grading standards, what has been ignored is that the schools may have little control over this behavior. Factors that are largely external to the school may have influenced both student performance and the allocations of time and effort to their studies.

The central point is that increasing homework and time on instructional tasks may have small effects on learning if there are few rewards to the individuals who must allocate their additional time and effort in these directions. More ominous is the possibility that by increasing the "costs" to the student by having to spend more time in what is often an oppressive and uninspiring environment, dropout rates may increase and some students may be turned-off to further learning. Additionally, some students may reduce their effort to compensate for the larger time commitment that they must make.

So, the individual allocation of time and effort to learning will depend crucially on the rewards associated with particular time and effort allocations. Compulsory increases in instructional time may have little achievement payoff if students reduce their effort or drop out. Accordingly, any effort to increase student time allocations to learning must consider not just a mechanical allocation of time, but the degree to which the existing system of rewards will encourage student effort and voluntary time on that learning task. Policy manipulations of instructional time in themselves may not yield the expected fruits suggested by the national reports.

3. Time and Educational Policy

Why have reformers viewed the increase of instructional time and time-on-task or engaged time as crucial ingredients for improving student achievement? There appear to be three reasons. First, is the compelling logic that more instructional time and better use of instructional time would lead to higher student achievement. Second is that other industrialized countries devote more time to schooling than the U.S. and reportedly obtain better results. Third, educational research has reported impressive relations between time-in-learning and student achievement.

Both logic and common sense support the explanation that increasing instructional time will improve student achievement. However, the argument is a very abstract and general one. It does not address either the strength of the relation or the possibility that it may be more pertinent under some circumstances than others. In the first case, the relation may hold, but the results may be so modest that they are relatively unimportant or even irrelevant to public policy. For example, assume that an increase in the length of the school day and days in the school session provided a rise in instructional time of 25 percent, but an increase in student achievement of only 3 percent. Further, if schools are spending an average of $2000 a year on instructional costs exclusive of buildings and facilities, we can assume that the increase in costs would be about 25 percent as well, or $500.

The crucial policy issues are whether it is worth an allocation of an additional $500 per student to increase student achievement by 3 percent, and whether there are other alternatives to increasing the time allocation that might be even more effective for the same cost outlay. For example, a rise in the budget of $500 per student could be used to attract more talented teachers, to retrain existing ones, to reduce class size, to hire remedial specialists, and to utilize instructional technologies such as video-tapes and computer-assisted instruction. It is certainly not clear which of these alternatives or which combination is the most preferable from a cost-effectiveness perspective. The effectiveness of increasing time in learning may be a logical argument, but there are no empirical results strong enough to justify this investment as being superior to investing equal amounts in other alternatives.

Indeed, recent evidence suggests the opposite. A new RAND study compared the costs and effects of four interventions for improving reading and mathematics scores: peer tutoring, reduction in class size, increase in the length of the school day and computer-assisted instruction. The increase in the school day would provide an additional hour of instruction each day at the primary level, divided equally between mathematics and reading. On a cost-effectiveness basis, the time intervention was found to rank at the bottom with respect to improving student performance in mathematics and third out of the four interventions in improving reading performance.

There is no empirical evidence that lengthening the school year by a few days can improve student performance. Yet, many states are increasing the minimum number of days that their schools

must be in session at great expense. For example, the State of California is considering incentives to school districts to increase the school year from its present minimum of 175 days to 180 days at a cost of about $35 per student per year or about $1000 a year for a typical classroom. Further, the State is offering incentives to increase the length of the school day. The total cost of increasing the school day and school year is estimated at over $250 million. The available evidence does not suggest that this is an efficient approach to using state resources for the improvement of education.

The international case has been made on the basis of associating the amount of schooling received in other countries with the achievement levels of their students and with the strength of their economies. It has been argued that the superior achievement of students in other industrialized societies is closely related to their greater exposure to schooling through longer school days and school years and that the economic success of such countries is connected to student achievement. Again, the direct evidence to support these claims is meager.

The issue of comparative performance in student achievement between the U.S. and other industrialized countries should be clarified. The U.S. educates a very large share of its secondary school age population, while most other industrialized countries do not. Since countries with more elite educational systems are enrolling only the most talented and advantaged segments of their youth in academic secondary schools — often on the basis of a competitive examination — the achievement of such students should only be compared with comparable cohorts of U.S. youth. Although the International Education Association (IEA) studies found that the U.S. ranked below other industrialized countries in average achievement, it found that the top echelon of students ranked favorably with similar cohorts in the more selective schooling systems.

There are many potential approaches to increasing time allotments to learning. Perhaps the relative modesty of the findings that relate instructional time, as opposed to how that time is used, to student achievement is due to the possibility that unless students perceive the importance of allocating more time to learning, they may reduce their levels of effort. From the perspective of the school, the most obvious policies are to improve the intrinsic attractions of the schooling experience or to improve the extrinsic sanctions associated with the desired time and effort allocations. The former is difficult to accomplish, as many teachers and schools do not know how to make learning a vital and engaging activity. Yet, it ought to be a crucial priority in school reform if the new emphases on increased instructional time, homework, and academic requirements are to be implemented in an effective manner. Although motivation through extrinsic devices can be done through tightening school discipline, a highly repressive environment may actually inure students to the overall schooling experience by creating automatons who follow the letter of expectations while avoiding their spirit. Such polices may serve to reduce student effort and to increase school dropouts.

Conclusions

The most reasonable conclusions on time in learning seem to be:

1. The effectiveness of increasing the time available for instruction and learning seems to be dependent crucially on how that time is used. Simple mechanical increases in the use of time may not have a significant impact on achievement or other school outputs, and they are likely to be costly relative to their effectiveness. Unfortunately, it is exactly this type of recommendation which is central to recent calls for educational reform. The empirical evidence also suggests that the effects on achievement will vary substantially among students, subjects, and instructional settings. However, the overall body of research findings on the subject is much thinner than implied by the claims of some researchers and policy analysts.

2. Research on time in learning should focus on studies in which both total instructional time and engaged time are manipulated experimentally to see how they affect academic achievement among different student populations, different grade levels, different modes of classroom organization, and different subjects. Such research should also concentrate on how particular approaches to increasing time affect achievement such as increasing the school day, the annual school session, individual class periods, and time devoted to specific subjects and topics.

3. Research should also seek to learn more about the interactions between the use of time in learning and student effort and the effect of both extrinsic and intrinsic rewards on getting students to allocate time and effort to their studies.

4. Policy evaluations of different approaches to increasing instructional time and engaged time should focus on both costs and effects of the alternatives. These should be compared with other instructional interventions for their cost-effectiveness rather than assuming that time-based improvements in schooling are superior to other alternatives.

While the evidence on the effectiveness of increasing total school time, total instruction time within school, and total engaged time seems to be more modest than the assertions of recent calls for school reform, this does not mean that such policies ought to be abandoned. Rather it means that a largely mechanical approach to time allocation should be avoided. Individual teachers ought to still explore how their time can be used more efficiently to provide instruction. Schools should seek to determine in which subjects and for which students more time is required for learning as well as how to provide that time most efficiently. All participants should focus on how existing time can be used more effectively by engaging students more fully and making school a much more vital and exciting experience than it presently is. But, each of these policies must be a sensitive and selective one rather than a broad brush approach to reform.

Finally, it should be humbling to researchers and policymakers alike to recognize that in the last decade three major national reports have argued that many of the problems of adolescence and causes of inadequate development for adulthood are created by the fact that youth spend too *much* time in school rather than too little. How is it that the "facts" and expert advice can change so quickly and profoundly? One shudders to think of the paroxysms faced by schools if decision-makers were to respond too quickly to the recommendations of the major reports on educational reform. ■

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